5/12/88

MRID Number 263581

DATA EVALUATION RECORD

1. **CHEMICAL:** 1,2-dibromo- 2,2-dichloroethyl dimethyl phosphate; Naled Technical

2. **TEST MATERIAL:** Naled Technical; Lot Number SX-1554; 90% purity

3. **STUDY TYPE:** Shrimp 96-hour LC50, flow-through
Species tested: Palaemonetes vulgaris

4. **CITATION:** Surprenant, D.C. 1986. Acute Toxicity of Naled Technical to Grass Shrimp (Paleamonetes (sp) vulgaris) Under Flow-Through Conditions. Bionomics Report #BW-86-4-1973. Prepared by Springborn Bionomics, Inc., Wareham, Massachusetts. Submitted by Chevron Environmental Health Center, Inc., Richmond, California. MRID Number 263581.

5. **REVIEWED BY:**

Kimberly D. Rhodes
Aquatic Toxicologist
ESE

Signature: Kimberly D. Rhodes
Date: May 11, 1988

6. **APPROVED BY:**

Isabel C. Johnson, M.S.
Principal Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: Isabel C. Johnson
Date: May 12, 1988

Henry T. Craven
Supervisor, EEB/HED
USEPA

Signature:
Date:

7. **CONCLUSIONS:** Although the author indicated that the measured concentration of the 27 ug/L treatment level was 28 ug/L at 0 and 96 hours of the exposure period, insufficient data was provided to verify the conclusions the authors made on the toxicity of the test substance. As a result, this study has been rated as supplemental. The reported 96-hour LC50 of 9.3 ug/L classifies Naled Technical as very highly toxic to grass shrimp.

8. **RECOMMENDATIONS:** N/A

9. BACKGROUND:

10. DISCUSSION OF INDIVIDUAL TESTS: N/A

11. MATERIALS AND METHODS:

A. Test Animals: Palaemonetes vulgaris were obtained from a commercial fish supplier in Florida and maintained for a minimum of 14 days. The grass shrimp were 0.02 to 0.15 gram wet weight with an average of 0.07 gram wet weight. No mortality was observed during the 48-hour holding period immediately prior to testing. The grass shrimp were 12 to 23 millimeters long with an average total length of 18 millimeters. All test organisms were fed a combination of live and frozen brine shrimp, ad libitum, daily during holding.

B. Test System: The exposure system used in this study was a modified, proportional diluter, similar to that described by Mount and Brungs (1967) with a 0.65 dilution factor. The flow rate provided 5.6 volume additions per day. The temperature was maintained by a water bath at 21 $\pm$ 1°C.

The dilution water was filtered natural seawater. The salinity of the seawater was 32 - 34°/oo, the pH was 7.8 - 7.9 and the specific conductance was 35,000 - 36,000 umhos/cm.

C. Dosage: 96-hour acute flow-through test.

D. Design: Ten grass shrimp were tested per test aquarium (20 per treatment level). A control, solvent control (acetone), and nominal Naled Technical concentrations of 4.8, 7.4, 11, 18, 27 ug/L were maintained. All mean measured concentrations less than that determined for the highest test concentration (28 ug/L) were reported by the author to be $\leq$10 ug/L. Since these measurements were near or below the limit of detection (10 ug/L), the authors concluded that extrapolation of test concentrations $\leq$28 ug/L to be more representative of actual exposure concentrations. The extrapolated measured concentrations based on the experimental dilution factor of 65 percent were 18, 12, 7.6, and 4.9 ug/L.

E. Statistics: The computer program developed by Stephan et al. was used to calculate the LC50 values.

12. REPORTED RESULTS: "The test concentrations (nominal and extrapolated measured), corresponding cumulative mortalities and observations made during the toxicity test are summarized in Table 1" (attached). "The 96-hour LC50 and corresponding 95% confidence interval (based on nominal concentrations of Naled Technical) were calculated by probit analysis to be 8.9 (7.8 - 10) ug/L. Calculations based on extrapolated measured concentrations of Naled Technical resulted in a 96-hour LC50 value (95% confidence interval) of 9.3 (8.1 - 11) ug/L.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:

The 96-hour LC50 for grass shrimp (Palaemonetes vulgaris) exposed to nominal concentrations of Naled technical under flow-through test conditions was 8.9 ug/L with 95 percent confidence limits of 7.8 and 10 ug/L. The 96-hour LC50 value based on extrapolated measured concentrations was 9.3 ug/L with 95 percent confidence limits of 8.1 to 11 ug/L. No slope was reported by the author.

The data were audited by the laboratory's Quality Assurance Unit to assure compliance with protocols, standard opeerating procedures and pertinent EPA Good Laboratory Practice (GLP) Regulations. A GLP compliance statement was included and signed by the Quality Assurance Unit.

14. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

A. Test Procedure: The test procedures were generally in accordance with protocols recommended by the Guidelines, but deviated from the SEP as follows:

Measured test concentrations were only available for the highest concentration tested (27 ug/L) while effects occurred at concentrations which could not by analytically determined.

In addition, the analytical methodology provided by the test laboratory does not appear to substantiate their decision to extrapolate test concentrations <28 ug/L. The data presented indicated approximately 91 percent recovery at a concentration of 10 ug/L, while chemical analyses conducted during the definitive test failed to confirm nominal concentrations in 11 and 18 ug/L which were both greater than the detection limit of 10 ug/L. Therefore, the view that the measured exposure concentrations of Naled Technical in the lower exposure solutions can be extrapolated is not shared by the reviewer and insufficient data is presented to make a more informed decision.

Grass shrimp are euryhaline and, therefore, should be tested at a salinity of 10 to 17 ppt.

B. Statistical Analysis: The reviewer used the computer program developed by Stephan et al. to calculate the LC50 values. These calculations are attatched. The program does indicate that probit analyses, as done by the author, should not be used with this set of data. However, the use of the moving average method provides a similar LC50 and 95 percent confidence limits (9.36 ug/L with limits of 8.35 to 10.47 ug/L).

C. Discussion/Results: The 96-hour LC50 value of 8.9 ug/L (nominal concentration) and 9.3 ug/L (extrapolated measured concentration) for Palaemonetes vulgaris classifies Naled Technical as very highly toxic. The toxicity test was conducted at a salinity of 32 - 34°/oo and a temperature of 20 - 22°C.

D. Adequacy of the Study:

(1) Classification: Supplemental

(2) Rationale: The author did not provide confirmation of test concentrations below 27 ug/L and evidence used to support the claim of extrapolating the measured concentrations from the highest test concentration are inconclusive.

(3) Repairability: Yes, submission of diluter calibration and verification of proper diluter function throughout the test, along with presentation of analytical results for all test concentrations. An explanation for the discrepancy between the recovery study and the test data should also be provided.

15. COMPLETION OF ONE-LINER FOR STUDY: Yes, May 11, 1988.

Table 1. Concentrations tested and corresponding mortalities of grass shrimp (Paleamonetes vulgaris) exposed to Naled technical during a 96-hour flow-through toxicity test. Mean measured concentrations are based on 0- and 96-hour analyses of the test solutions.

Nominal Concentrations Naled technical as (µg/L)	Measured Concentrations Naled technical (µg/L)	Cumulative Mortality (%)											
		24-hour			48-hour			72-hour			96-hour		
		A	B	$\bar{x}$	A	B	$\bar{x}$	A	B	$\bar{x}$	A	B	$\bar{x}$
27	28[h]	0	0	0[ab]	60	50	55[ae]	90	100	95[f]	100	100	100
18	18[i]	0	0	0[c]	30	40	35[bde]	70	80	75[de]	100	100	100
11	12[i]	0	0	0	10	0	5[df]	20	50	35[bdf]	40	80	60[aeg]
7.4	7.6[i]	0	0	0	0	0	0[d]	0	10	5[dg]	50	40	45
4.8	4.9[i]	0	0	0	0	0	0[d]	0	0	0[d]	0	0	0[a]
olvent control	--	0	0	0	0	0	0	0	0	0	0	0	0
control	--	0	0	0	0	0	0	0	0	0	0	0	0

a Several organisms were opaque in color.
b Several organisms exhibited partial loss of equilibrium.
c One organism was opaque in color.
d Several organisms were dark in color.
e Several organisms exhibited complete loss of equilibrium.
f One organism exhibited complete loss of equilibrium.
g One organism exhibited partial loss of equilibrium.
h Measured concentration based on the results of the analysis of the 27 µg/L treatment level at 0 and 96 hours of the exposure period.
i Measured concentration was extrapolated based on the analytical results of the highest treatment level and the experimental dilution factor (0.65).

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CONC.	NUMBER EXPOSED	NUMBER [illegible]	PERCENT [illegible]	BINOMIAL PROB. (%)
28	20	[illegible]	[illegible]	9.536743E-05
18	20	20	100	9.536743E-05
12	20	12	60.00001	25.17223
7.6	20	9	45	41.19015
4.9	20	0	0	9.536743E-05

THE BINOMIAL TEST SHOWS THAT 4.9 AND 18 CAN BE USED AS STATISCALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 90.99982 PERCENT.
AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 8.245656

>>>>>>>>RESULTS CALCULATED BY THE MOVING AVERAGE METHOD

SPAN	G	[illegible]	[illegible] PERCENT CONFIDENCE LIMITS	
3	5.109884E-02	[illegible]360483	[illegible]50182	[illegible].47116

NO CONVERGENCE IN 25 ITERATIONS. THE PROBIT [illegible] PROBABILITY
CANNOT BE USED WITH THIS SET OF DATA.